

Continuous-Scan Phased Array Measurement Methods for Turbofan Engine Acoustic Testing, Phase II

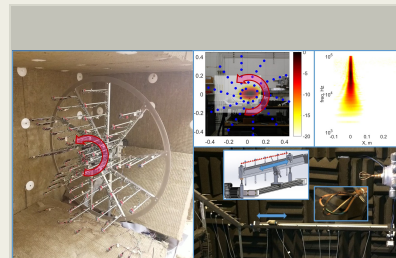
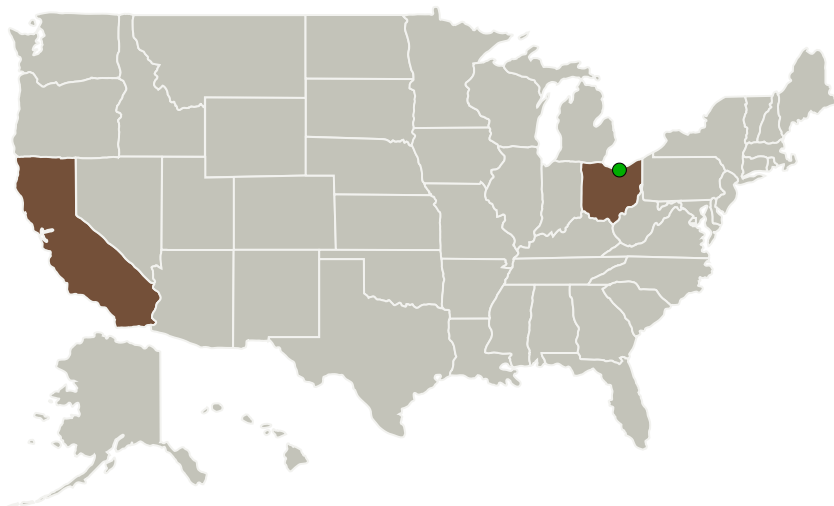
Completed Technology Project (2017 - 2019)



Project Introduction

To allow aviation growth to continue in the face of increasingly stringent noise pollution standards, new aircraft engines must be designed with noise performance as a principal constraint. Technologies to realize future propulsion noise reduction will require detailed experimental characterization and diagnosis of the acoustic mechanisms and sources within an engine system or component. ATA Engineering, Inc. (ATA) proposes an SBIR project to further develop and validate methods for obtaining phased array acoustic data from complex distributed noise sources using continuously moving, or continuous-scan (CS) microphones in conjunction with state-of-the-art phase-referencing techniques. The benefits of the CS method include (1) effectively infinite spatial resolution, as the sound field cross-spectrum may be described between any two locations along the scan trajectory, (2) preservation of phase data for improved source and propagation modeling, including beamforming (BF) and acoustical holography (AH), (3) significant reduction of test data acquisition time (potentially two to ten times faster) per operational point, and consequently either (4) reduced test operational cost, or (5) the opportunity to screen more design concepts within a given budget. The Phase II effort will use subscale aeroacoustic testing to validate the novel continuous-scan beamforming (CSBF) measurement techniques with the aim of eventual implementation in NASA acoustic wind tunnel and free-jet testing facilities. ATA will also formalize a CS software toolkit for data processing and visualization and design a full-scale array concept for a candidate NASA wind tunnel facility.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
ATA Engineering, Inc.	Lead Organization	Industry	San Diego, California
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
California	Ohio

Project Transitions

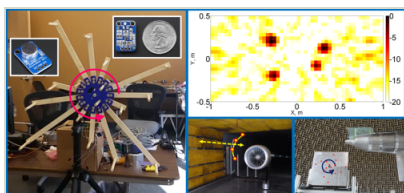
▶ **April 2017:** Project Start

✓ **April 2019:** Closed out

Closeout Documentation:

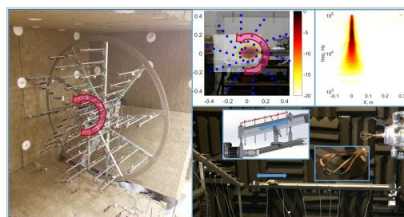
- Final Summary Chart(<https://techport.nasa.gov/file/141003>)

Images



Briefing Chart Image

Continuous-Scan Phased Array Measurement Methods for Turbofan Engine Acoustic Testing, Phase II Briefing Chart Image (<https://techport.nasa.gov/image/126490>)



Final Summary Chart Image

Continuous-Scan Phased Array Measurement Methods for Turbofan Engine Acoustic Testing, Phase II (<https://techport.nasa.gov/image/133843>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

ATA Engineering, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

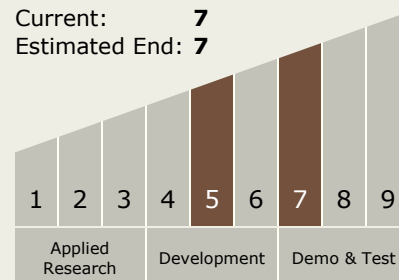
Carlos Torrez

Principal Investigator:

Parthiv N Shah

Technology Maturity (TRL)

Start: 5
Current: 7
Estimated End: 7



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Technology Areas

Primary:

- TX15 Flight Vehicle Systems
 - └ TX15.1 Aerosciences
 - └ TX15.1.4 Aeroacoustics

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System